

WHAT IS CLAIMED IS:

SUB B1 1. An optical storage medium comprising a polarization-sensitive member having a photo-induced birefringence property.

2. The optical storage medium as set forth in claim 1, further comprising a light transmitting substrate, wherein the polarization-sensitive member is formed on at least one side of the substrate as a layer.

SUB B2 3. The optical storage medium as set forth in claim 1, wherein the polarization-sensitive member comprising at least one element selected from the group consisting of a polymer having a photoisomerizable moiety as a side chain and a liquid crystal polymer.

4. The optical storage medium as set forth in claim 1, wherein the polarization-sensitive member comprising a polymer and photoisomerizable molecules dispersed therein.

5. The optical storage medium as set forth in claim 3, wherein the photoisomerizable moiety includes azobenzene structure.

6. The optical storage medium as set forth in claim 3, wherein one of the polymer and the liquid crystal polymer is a polyester-type polymer.

7. The optical storage medium as set forth ^{and} claim 1, wherein the substrate is in a form of a disk.

8. An optical storage method comprising the steps of:
providing a signal beam retaining spatial polarization modulated data modulated with a spatial light modulator capable of modulating polarization;
and

illuminating an optical storage medium with the signal beam and a reference beam simultaneously for storing a hologram of the polarization modulated data retained by the signal beam in the optical storage medium.

a light source that emits coherent light;
a spatial light modulator that modulates polarization of the coherent light from the light source in accordance with data and obtains a signal beam retaining spatial polarization modulated data;
an optical system that transmits the signal beam to an optical storage medium; and
a reference beam generating system that generates a reference beam to illuminate the optical storage medium.

16. The optical storage apparatus as set forth in claim 15, wherein the spatial light modulator rotates a polarization angle of the signal beam in accordance with the data.

17. The optical storage apparatus as set forth in claim 15, wherein the spatial light modulator comprises an electro-optical element and transparent electrodes formed thereon.

18. The optical storage apparatus as set forth in claim 17, wherein the electro-optical element comprises a liquid crystal.

19. The optical storage apparatus as set forth in claim 15, wherein the optical storage medium is in a form of a disk.

20. The optical storage apparatus as set forth in claim 19, further comprising:

a medium driving mechanism that rotates the optical storage medium;
and

a head moving mechanism that moves an optical head including the light source, the spatial light modulator, the optical system and the reference beam generating system in a direction of a diameter of the optical storage medium.

21. The optical storage apparatus as set forth in claim 15, further comprising the optical storage medium.

22. An optical storage medium storing a hologram of spatial polarization modulated data retained by a signal beam cooperatively with a reference beam.

23. The optical storage medium as set forth in claim 22, wherein a new hologram of a light intensity modulated data or phase modulated data is multiplexed on the hologram by modulating a polarizing direction of the signal beam or the reference beam in a same region of the optical storage medium.

24. The optical storage medium as set forth in claim 22, wherein the optical storage medium is in a form of a disk.

25. An optical reading method comprising the steps of:
illuminating with a read beam an optical storage medium storing a hologram generated cooperatively by a reference beam and a signal beam retaining spatial polarization modulated data; and
reading the polarization modulated data retained by a diffracted light from the hologram.

26. The optical reading method as set forth in claim 25, wherein a polarizing direction of the read beam is the same as that of the reference beam.

27. The optical reading method as set forth in claim 26, wherein an incident direction of the read beam to the optical storage medium is opposite to the same of the reference beam.

28. The optical reading method as set forth in claim 25, wherein the diffracted light has the same polarizing direction as the signal beam by modulating the polarizing direction of the diffracted light by a polarizer or half-wave plate.

29. The optical reading method as set forth in claim 25, wherein the diffracted light is separated into two polarization components orthogonal to each other and a comparative operation on their light intensities is performed

to obtain a result as a reading output.

30. An optical reading method comprising the steps of:
- illuminating with a read beam an optical storage medium storing a hologram generated cooperatively by a reference beam and a signal beam retaining spatial polarization modulated data;
 - separating a diffracted light from the hologram into two polarization components orthogonal to each other;
 - performing a comparative operation on light intensities of the two polarization components; and
 - reading the data based on a result of the comparative operation.

31. An optical reading method comprising the steps of:
- illuminating with a read beam having linear polarization an optical storage medium that stores a first and a second holograms multiplexingly in a same region thereof, the first hologram of spatial polarization modulated data that is created with a first beam having a first polarizing direction and the second hologram of light intensity modulated or phase modulated data that is created with a second beam having a second polarizing direction; and
 - extracting one of the holograms from the region of the optical storage medium by separating a polarization component of a diffracted light therefrom.

32. The optical reading method as set forth in claim 31, wherein the first beam and the second beam includes a reference beam and a signal beam having alternatively a parallel polarizing direction and an orthogonal direction to the reference beam, the read beam having the same polarizing direction with the reference beam and the polarization component of the diffracted light having the same polarizing direction with the signal beam.

33. The optical reading method as set forth in claim 25, wherein the optical storage medium is in a form of a disk, further comprising the steps of rotating the disk and moving an optical reading head including an optical system for the read beam in a direction of a diameter of the disk.

34. An optical reading apparatus comprising:

an optical system that emits a read beam on an optical storage medium storing a hologram of spatial polarization modulated data retained by a signal beam generated cooperatively by the signal beam and a reference beam each of which has a polarizing direction;

a polarizing beamsplitter that separates a diffracted light from the hologram into polarization components; and

a photodetector that detects a distribution of a polarization modulation of the diffracted light based on the polarization components.

35. The optical reading apparatus as set forth in claim 34, wherein the polarizing direction of the read beam is the same as that of the reference beam.

36. The optical reading apparatus as set forth in claim 35, wherein the optical system emits the read beam on the optical storage medium from an opposite direction to the reference beam.

37. The optical reading apparatus as set forth in claim 34, wherein the polarizing beamsplitter separates the diffracted light into two polarization components which are orthogonal to each other and the photodetector comprises two detectors each of which independently detects corresponding one of the two polarization components.

38. The optical reading apparatus as set forth in claim 37, further comprising:

an comparative operation element that performs a comparative operation on outputs from the two detectors.

39. The optical reading apparatus as set forth in claim 34, further comprising:

a driving mechanism that rotates the optical storage medium;

an optical reading head that includes the optical system, the polarizing beamsplitter and the photodetector; and

a head moving mechanism that moves the optical reading head in a direction of a diameter of the optical storage medium.

40. The optical reading apparatus as set forth in claim 34, further comprising the optical storage medium.

41. An optical retrieving method comprising the steps of:
illuminating with a read beam an optical storage medium storing a hologram generated cooperatively by a reference beam and a signal beam retaining spatial polarization modulated data as retrieving object data;
transmitting a diffracted light from the hologram through a spatial light modulator that modulates polarization of the diffracted light in accordance with retrieving data; and
detecting matching between the retrieving data and retrieving object data based on a polarization modulation of the transmitted diffracted light.

42. An optical retrieving method comprising the steps of:
illuminating with a read beam an optical storage medium storing a hologram generated cooperatively by a reference beam and a signal beam retaining spatial polarization modulated data as retrieving object data;
transmitting a diffracted light from the hologram through a spatial light modulator that modulates polarization of the diffracted light in accordance with retrieving data; and
detecting correlation between the retrieving data and retrieving object data based on a polarization modulation of the transmitted diffracted light.

43. The optical retrieving method as set forth in claim 41, wherein the optical storage medium is in a form of a disk, further comprising the steps of rotating the disk, and moving an optical retrieving head containing the spatial light modulator in a direction of a diameter of the disk.

44. An optical retrieving apparatus comprising:
an optical system that emits a read beam on an optical storage medium storing a hologram generated cooperatively by a reference beam and a signal beam retaining spatial polarization modulated data as retrieving object data;
a spatial light modulator that modulates polarization of a diffracted

light from the hologram in accordance with retrieving data;

a polarizing beamsplitter that separates the diffracted light from the spatial light modulator into two polarization components; and

a photodetector that detects a polarization modulation of the diffracted light based on the polarization components.

45. The optical retrieving apparatus as set forth in claim 44, wherein the polarizing beamsplitter separates the diffracted light into two polarization components which are orthogonal to each other and the photodetector comprises two detectors each of which independently detects corresponding one of the two polarization components.

46. The optical retrieving apparatus as set forth in claim 45, further comprising:

an comparative operation element that performs a comparative operation on outputs from the two detectors.

47. The optical retrieving apparatus as set forth in claim 44, wherein the spatial light modulator comprises an electro-optical element and transparent electrodes formed thereon.

48. The optical retrieving apparatus as set forth in claim 47, wherein the electro-optical element comprising a liquid crystal.

49. The optical retrieving apparatus as set forth in claim 44, further comprising:

a driving mechanism that rotates the optical storage medium;

an optical retrieving head that includes the optical system, the polarizing beamsplitter and the photodetector; and

a head moving mechanism that moves the optical retrieving head in a direction of a diameter of the optical storage medium.

50. The optical retrieving apparatus as set forth in claim 44, further comprising the optical storage medium.

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